

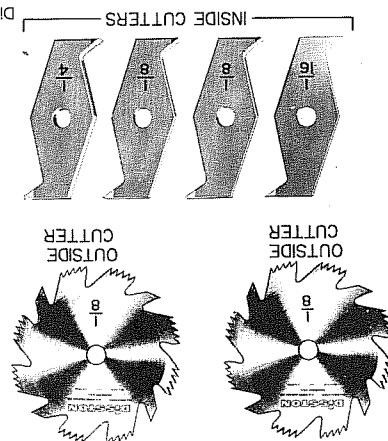
loosen in the direction of rotation.) See Fig. 35-5. Install the new blade so the teeth point in the direction the blade rotates. This will be toward the front of the saw. Use the scrap piece to hold the blade as you replace and tighten the arbor nut. Then replace the table insert and guard.

Table Saw Safety



- Know and follow the general safety rules for operating power tools on page 211.
- You cannot use the guard for all operations. Have your instructor check any setup that does not include the guard. Special setups should also be checked by your instructor.
- Never cut freehand on the table saw. Use the rip fence for ripping and the miter gauge for crosscutting.
- Always maintain control of the stock between the fence and the blade. Use your hand to push the stock away from the blade. Use a push stick for narrow stock. This will prevent a kickback.
- Never stand directly behind the blade.
- Never place your hands in line with the cut.
- Use a sharp blade. Dull blades are dangerous. They are more likely to cause kickbacks. Dull blades also require more pushing. This increases the chances of your hands slipping.
- The stock must lie flat on the table. Never cut warped or twisted stock on a table saw. Edges placed against the rip fence must be straight.
- Helpers should only support and hold stock. They should never pull or push the stock through the blade. The operator should always be in control.
- Never remove scrap cuttings from around the blade unless the machine has been turned off and has come to a complete stop.

Fig. 35-3. Dado heads are used to make cuts wider than those made by a single saw blade. Wide cuts are necessary to make dadoes, grooves, and rabbets.



Diston, Inc.

Fig. 35-4. This is an adjustable dado head. The head is adjusted to different widths by turning the center portion of the blade.

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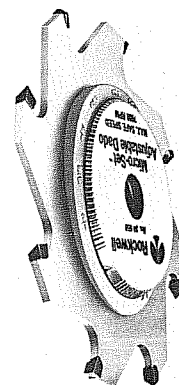
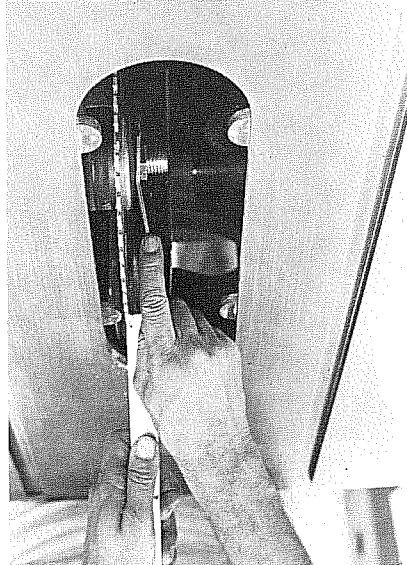


Fig. 35-5. Use a scrap piece to wedge the blade while you tighten or loosen the arbor nut. Make sure the power has been disconnected before you do this.



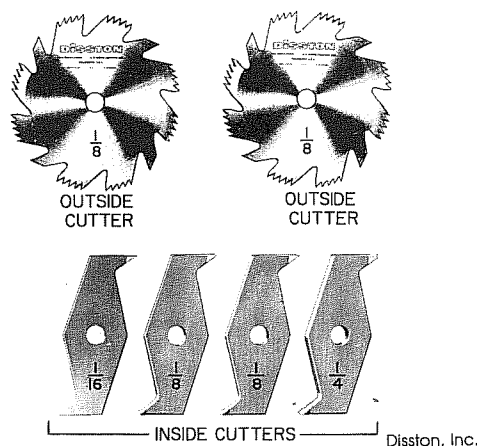
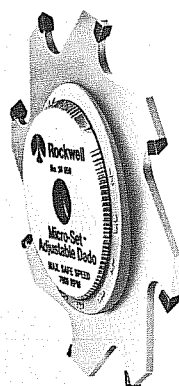


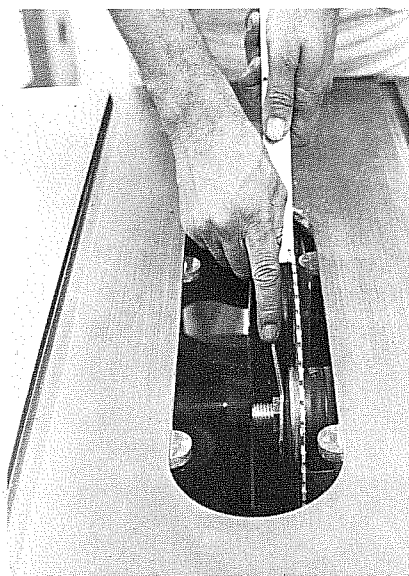
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Rockwell International

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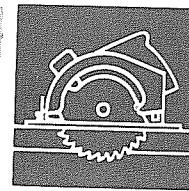
loosen in the direction of rotation.) See Fig. 35-5. Install the new blade so the teeth point in the direction the blade rotates. This will be toward the front of the saw. Use the scrap piece to hold the blade as you replace and tighten the arbor nut. Then replace the table insert and guard.

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- Never remove scrap cuttings from around the blade unless the machine has been turned off and has come to a complete stop.

Table Saw



Chapter 35

Table saws are also called circular saws and variety saws. They are used for many basic operations. They are also used to cut several kinds of joints. Ripping, crosscutting, mitering, and tapering can all be done on table saws. Table saws are probably the most useful, versatile power tools used in woodworking.

A typical table saw is shown in Fig. 35-1. Below the table is a saw **arbor** that holds the

circular saw blade. On different sides of the frame are raising and tilting wheels. The wheels are used to raise, lower, and tilt the saw arbor and blade. The safety guard and splitter cover the blade and protect the operator. Tables are equipped with a miter gauge for crosscutting and a rip fence for ripping. Table saw sizes are determined by the largest blade diameter recommended for a machine. Most saws hold blades up to 10 inches in diameter.

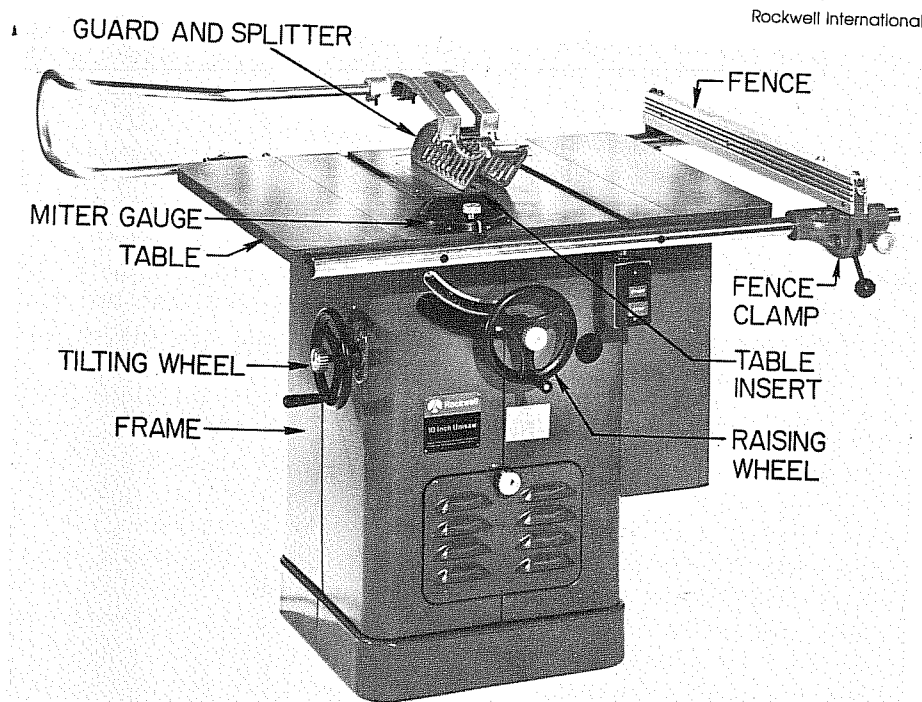


Fig. 35-1. The table (circular) saw is probably the most versatile and useful power tool in the woodwork ing shop.

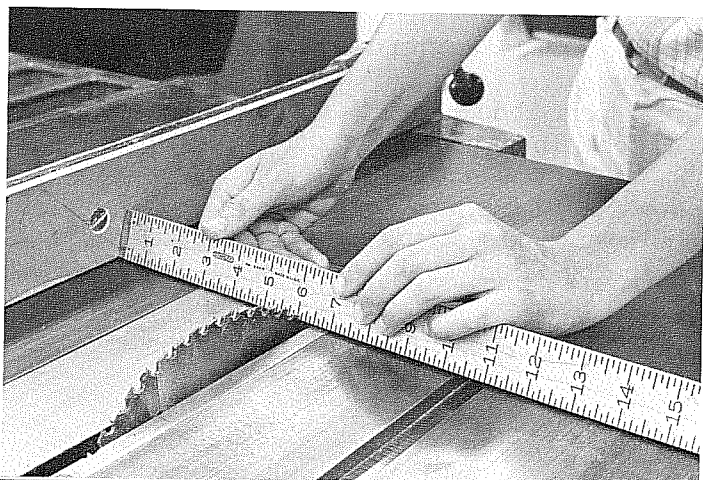
- Never use the fence as a guide if the distance between the blade and the fence will be greater than the length of stock against the fence.
- Clamp a clearance block to the fence when you use the fence as a stop for cutting short pieces to length.
- Table saw blades should project no more than $1/8$ inch (3 mm) above the surface of the stock.
- Lower the blade below the table when you finish with the saw. Do not leave the machine until the blade comes to a complete stop.

Ripping

Before you rip a board, make sure it has been properly prepared. It must have one straight edge. The bottom face must be flat. Use either a rip saw or combination blade. Adjust the blade to project $1/8$ inch (3 mm) above the stock's surface.

Set the fence the desired distance from the blade. Most machines have a ripping scale on the front edge of the table. With the machine off, check the distance. Measure from the fence to a blade tooth set toward the fence. See Fig. 35-6. Allow an extra $1/16$ inch (1.5 mm) if you must later plane the sawed edge smooth. Never rip stock that is shorter than the distance between the blade and the fence.

Fig. 35-6. To set the rip fence for ripping, measure from the fence to a blade tooth bent toward the fence. Be sure the machine is turned off.



Do not stand directly behind the blade when ripping. Most operators stand slightly to the left. Put the straight edge of the board against the fence. The flat face should be down. Start the motor. Push the stock firmly into the blade with your right hand. Use your left hand to hold the stock against the fence. Always keep your left hand away from the blade. See Fig. 35-7.

If you rip a board less than 4 inches (100 mm) wide, use a **push stick**. See Figs. 35-8 and 35-9. The push stick will protect your hands as you feed the stock. To hold long, narrow stock,

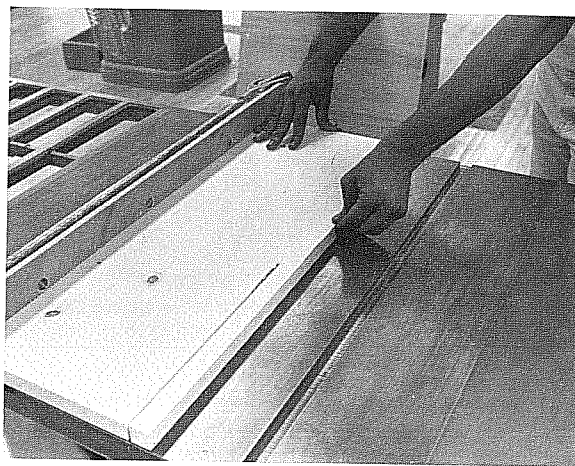
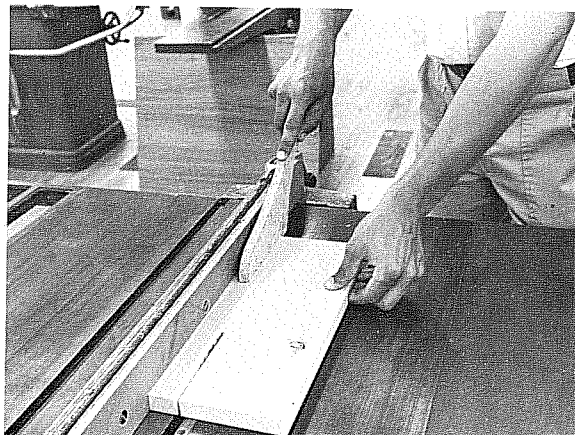
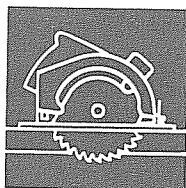


Fig. 35-7. When you rip a board, stand slightly to the left of the blade. Push with your right hand and hold the board against the fence with your left. Keep both hands away from the blade. (The guard has been removed to show the operation.)

Fig. 35-8. To rip narrow boards less than 4 inches (100 mm) wide use a push stick. For some narrow pieces it is necessary to remove the guard. (The guard has been removed to show the operation.)



Chapter 38



Jointer and Power Plane

Jointers are machines that do the work of a hand plane. Jointers are used mainly to make edges straight and square. They are also used to smooth surfaces. Rabbits, tongues, chamfers, bevels, and tapers are sometimes cut on jointers.

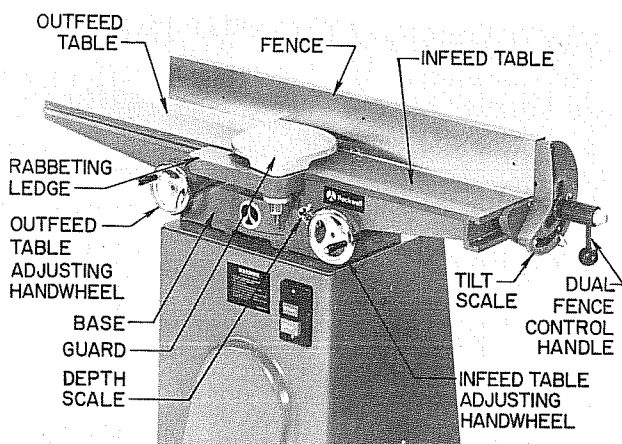
The parts of a jointer are shown in Fig. 38-1. The cutting is done with knives mounted in the cutterhead. The **cutterhead** holds three knives

and turns at a high speed. See Fig. 38-2. The length of the knives determines the jointer's size. This length also determines the widest board the jointer will plane. An 8-inch jointer, for example, has knives 8 inches (200 mm) long. It will plane surfaces up to 8 inches wide.

Jointers have two tables — the infeed and the outfeed. Both tables are raised and lowered with handwheels. Adjusting the **infeed table** controls the cutting depth. The lower the infeed table sits below the knives, the deeper the cut. A depth scale on the machine shows the cutting depth. The **outfeed table** is always set at the same height as the knives. The outfeed table holds the stock level as it comes through the cut.

The fence runs along the length of the tables. For most operations it is perpendicular to the tables. It can be tilted from 90° to 45° for cutting bevels and chamfers. The angle of tilt is shown on the tilt scale.

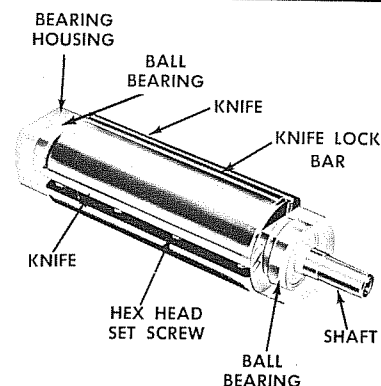
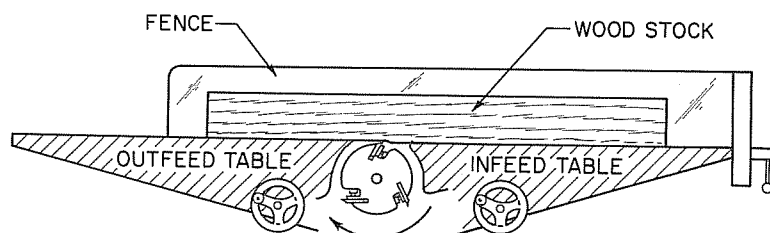
You can also clamp the fence at different locations across the tables. This is done for rabbeting. It is also done to make use of sharp areas on the knives. Simply loosen the fence clamp and slide it to the desired location. Then reclamp it.



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Fig. 38-1. The parts of a jointer. The cutterhead is located under the guard.

Fig. 38-2. As the cutterhead revolves between the two tables, the knives cut the stock.





Jointer Safety

- Know and follow the general safety rules for operating power tools on page 211.
- Never joint a board less than 10 inches (250 mm) long. Short stock can tip down into the cutterhead. Then the stock could be thrown back with tremendous force.
- Always use a push stick when planing a face. This protects your fingers as the end crosses the cutterhead.
- Never stand directly behind the jointer. This is a dangerous position if the stock kicks back.
- Keep your fingers away from the front of the stock. While jointing a face, keep your fingers at least 6 inches (150 mm) from the front end.
- Never apply pressure with your hands directly over the cutterhead. Always keep your hands at least 4 inches (100 mm) from the cutterhead.
- Always feed the stock **with** the grain. This reduces vibration and produces a smoother cut.
- Get your instructor's approval when making special setups.
- Do not leave the machine until the cutterhead has completely stopped.

Planing a Face

Boards often need to be cut to finish size. The first step is usually planing a face flat. This can be done on a jointer. To plane a face flat on a jointer, adjust the cutting depth. The depth will depend on the width and hardness of the stock. Make shallow cuts on wide or hard stock. You can make deeper cuts on narrow or soft stock. Generally, the cutting depth should not be more than 1/8 inch (3 mm) for soft or narrow stock. It should not be more than 1/16 inch (1.5 mm) for hard or wide stock.

Do not remove any more material than is necessary. When possible, make a few heavy cuts. Making many light cuts will usually produce an unwanted taper. Feed the stock so it

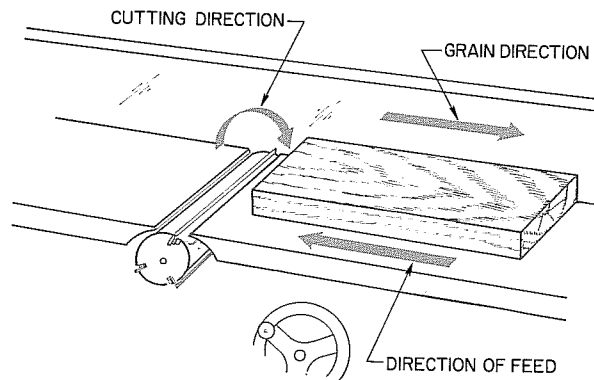


Fig. 38-3. Feed the stock so the knives cut in the same direction as the grain. This will prevent chipping.

will be cut **with** the grain. See Fig. 38-3. Cutting **against** the grain can cause the wood to chip. If the stock is warped, place the concave side down.

Always use a push block. See Figs. 38-4 and 38-5. Hold the push block with your right hand. Hold the center of the stock with your left hand. Keep your fingers away from the ends of the board. Push the stock into the cutter at a slow, steady rate. Apply even downward pressure. Feeding the stock too fast will produce a rough cut.

Jointing an Edge

For many operations, you must make an edge straight and square with a face. Doing

Fig. 38-4. Push block

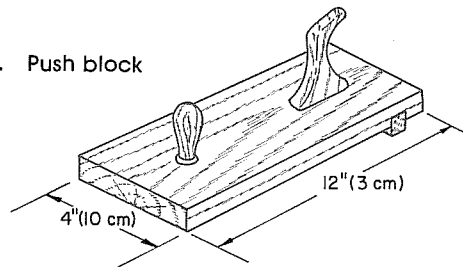
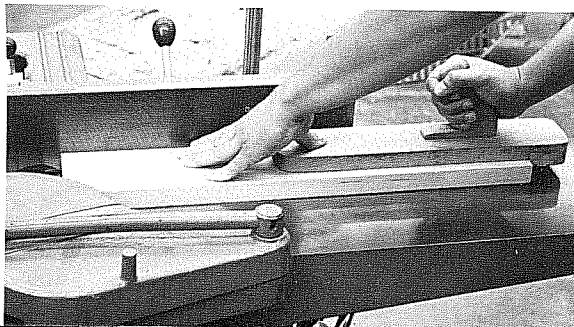


Fig. 38-5. Using a push block to plane a face



this on a jointer is called **jointing**. Before you joint an edge, check that the fence is perpendicular to the table. Use a try square as shown in Fig. 38-6. Then adjust the infeed table to the cutting depth. Usually this will be less than 1/8 inch (3 mm).

Hold the already planed face firmly against the fence. Feed the stock so it will be cut **with** the grain. Push the end of the board with your right hand. Use a push stick for narrow boards. With your left hand hold the stock against the table and fence. As your left hand approaches the cutterhead, move it to the rear table. See Fig. 38-7. Never apply pressure to the board directly over the cutterhead.

Do not try jointing extremely rough or irregular edges. Use a handsaw or band saw to make the edges straight. Then run the edges through the jointer.

Planing End Grain

You can usually cut end grain smoothly and accurately with a sharp saw. You can, however, trim end grain on a jointer when necessary. The board must be at least 10 inches (250 mm) wide to do this.

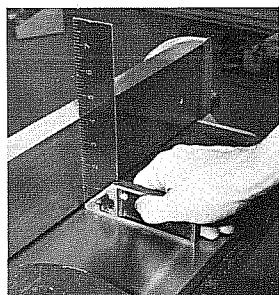


Fig. 38-6. Use a try square to check that the fence is square with the table.

Fig. 38-7. Edge jointing a board. Never place your hand directly over the cutterhead. (The guard has been removed to show the operation.)

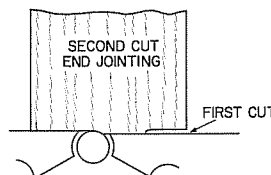
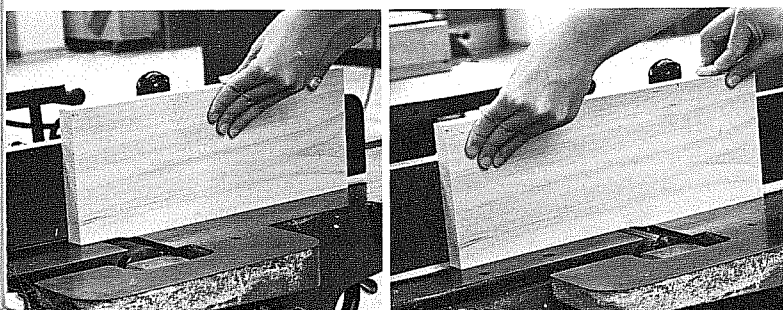


Fig. 38-8. When planing end grain, make a short cut from one end. Then complete the cut from the other end. This will prevent splintering. (The guard has been removed to show the operation.)

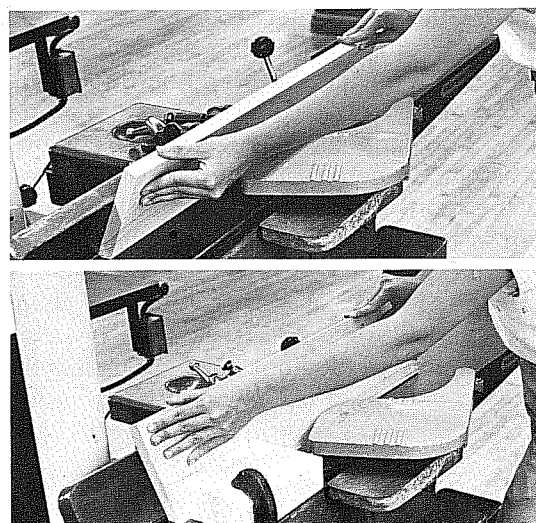
Adjust the infeed table for light cuts. Make a short cut from one edge of the end grain. See Fig. 38-8. Then turn the piece around. Feed from the second edge. Feed the stock until it meets the first cut. This will prevent the back edge from chipping.

If you are planing both ends and both edges, plane the ends first. Then plane the edges. This way you can smooth any chipped end grain when you plane the edges.

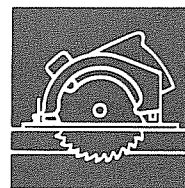
Planing Bevels and Chamfers

To cut a bevel or chamfer, adjust the fence to the desired angle. Check the tilt of the fence with a T-bevel. You can tilt the fence in or out. Greater accuracy is possible with the fence tilted over the table. See Fig. 38-9. If you must

Fig. 38-9. You can tilt the fence either in or out to cut bevels and chamfers on a jointer. Use a block to hold the stock against the fence when the fence is tilted away from the table (bottom photo).



Surfacer



Chapter 39

Surfacers are also called **planers** and **thickness planers**. They are used to cut boards to a desired thickness. They are not used for any other purpose. A standard surfacer is shown in Fig. 39-1.

Surfacers, like jointers, have a rotating cutterhead. The cutterhead contains either three or four knives. Unlike jointers, surfacers cut from the top rather than the bottom. They are also **self-feeding**. This means that the machine pulls the stock through the cut.

The diagram in Fig. 39-2 shows how a surfacer works. The **infeed rolls** feed the stock into the cutterhead. They feed the stock at a steady rate. Notice that the top roll is corrugated. This gives the roll a better grip on the stock. The chip breaker prevents kickbacks and chipping. The pressure bar holds the stock down as it

comes through the cut. The stock then passes between the two **outfeed rolls**. These rolls continue the self-feeding process.

Surfacers are manufactured in various sizes. Sizes are determined by the widest, thickest board a machine can surface. The 18 x 6 inch and 24 x 8 inch machines are commonly found in school shops.

Surfacer Safety



- Know and follow the general safety rules for operating power tools on page 211.
- Remove all loose knots from the stock before surfacing.
- Do not surface stock shorter than the distance between the centers of the infeed and outfeed rolls. This is usually 12 inches (300 mm), or less.
- Never stand directly behind a board being surfaced. The stock could kick back and cause an injury.
- Never look into the surfacer while the cutterhead is rotating.

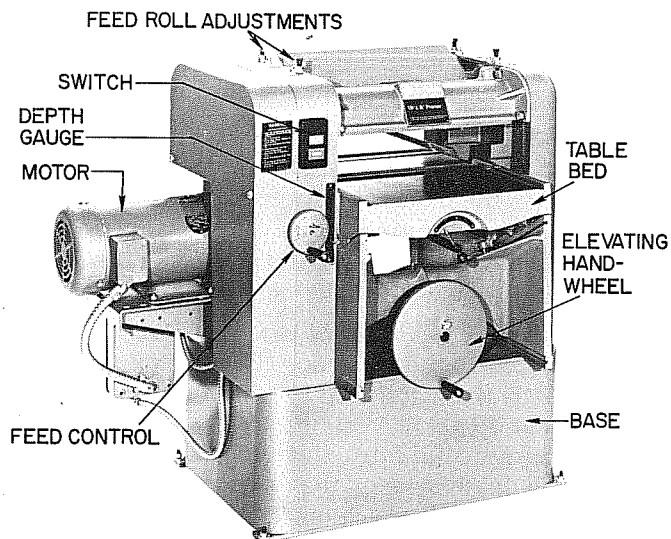


Fig. 39-1. Surfacer

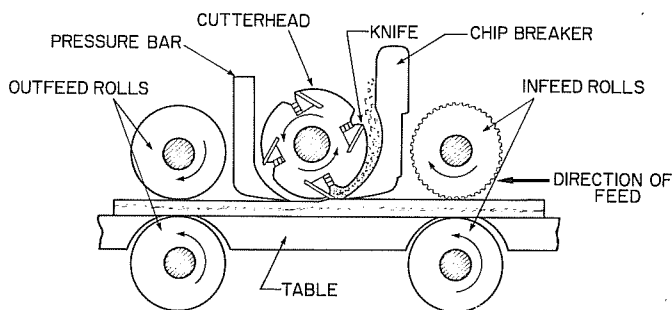


Fig. 39-2. Surfacer is self-feeding. The infeed and outfeed rolls move the stock at a steady rate. The table adjusts up and down to control the cutting depth.

- Make sure one face is flat before you surface a board. Place the flat face against the table.
- If a board does not feed through the surfacer, turn off the power. Wait until the cutterhead stops completely. Then lower the table and remove the board.
- Keep your hands away from the areas around the feed rolls. You could easily pinch your fingers in these areas.
- Feed the stock **with** the grain. Otherwise, the stock can chip and break. The pieces can then be thrown from the surfacer.

Surfacing Stock

Do not surface a board unless it has a flat face. If necessary, plane a face flat on a jointer. Then measure the board at its thickest part. Subtract the desired cutting depth from this measurement. Adjust the table to this setting with the elevating handwheel.

The cutting depth depends on the board's width and hardness. Generally 1/16 inch (1.5 mm) is the maximum cut. Always plan the cuts. Try to remove an equal amount of stock from each side of the board. This will reduce warpage.

Place the flat surface down on the table. Turn the board so it will be cut **with** the grain. See Fig. 39-3. Start the machine. Slide the board forward until the infeed rolls begin

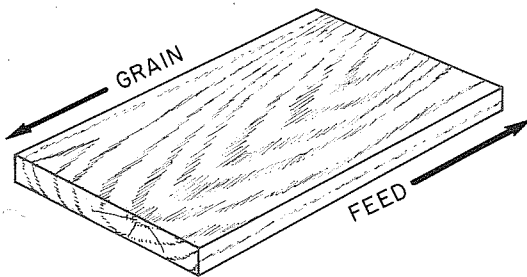


Fig. 39-3. Feed stock into surfacers so the cut will be made **with** the grain. This will produce a smoother cut.

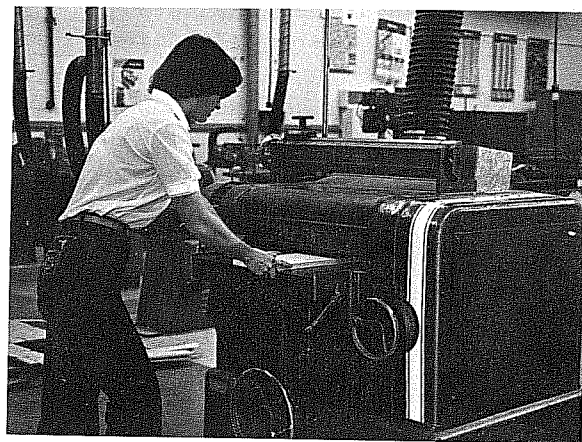


Fig. 39-4. Stand to one side of the board as you feed stock into the surfacer.

feeding it. See Fig. 39-4. Then move around the machine. Support the long pieces as they come through the machine. Make additional cuts as needed.

When surfacing boards of various thicknesses, plane the thickest boards first. Plane the boards until they are all the same thickness. You can then surface them without resetting the machine for every board.

Some surfacers have a variable-speed feed control. You can use the faster feed rates for rough cuts. Use the slowest feed rate for finish cuts.

Short Stock. Some boards are too short for a surfacer to feed. To be surfaced, a board must be as long as the distance between the centers of the infeed and outfeed rolls. This distance depends on the manufacturer and the size of the machine. It is usually about 12 inches (300 mm). Do not put boards shorter than 12 inches in the surfacer.

If you are surfacing several short boards, butt them end to end. See Fig. 39-5. This will produce a more uniform thickness for each board. It will also keep the boards moving steadily through the machine. To use this procedure you must first make the boards the same thickness.

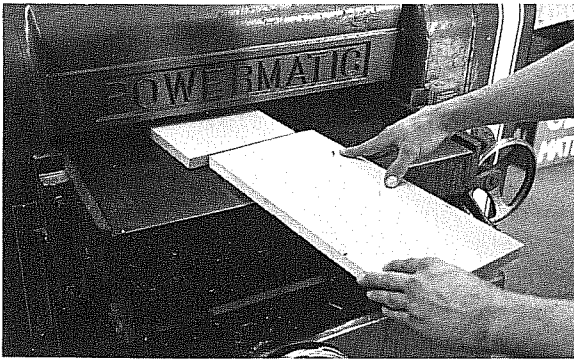


Fig. 39-5. Butt short pieces end to end to feed them through the surfacer. This produces a more uniform thickness and keeps the boards moving. Never put a board less than 12 inches (300 mm) long in a surfacer.

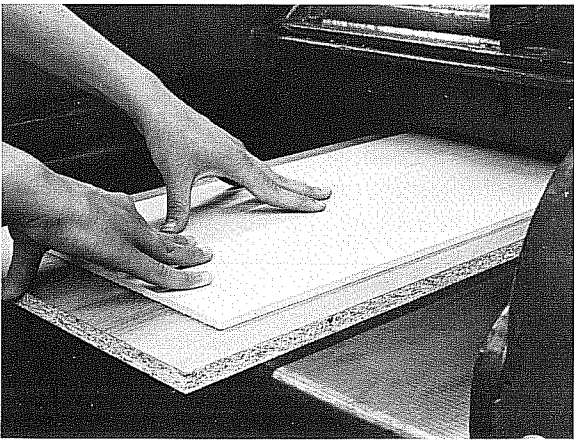


Fig. 39-6. To surface stock less than 1/4 inch (6 mm) thick, place it on a backing board. The backing board must be of uniform thickness. It must also be longer and wider than the stock.

Thin Stock. Surfacers can break up stock less than 1/4 inch (6 mm) thick. You can avoid this by placing thin stock on a backing board. A **backing board** is a scrap piece of uniform thickness. The backing board must be longer than the stock to be surfaced. It should also be wider than the stock. See Fig. 39-6. To set the depth of cut, measure the total thickness of both pieces. Then subtract the amount to be cut off. Set the surfacer for the resulting thickness. Feed the thin stock as you would a single board.

Squaring Stock

You often need to square stock while cutting it to finish size. To square stock you must do a sequence of operations. You can use the following sequence for most jobs.

1. Plane the best face flat and true on a jointer. If the stock is too wide, use a hand plane.
2. With the planed face against the fence, joint the best edge. If grain direction makes this impossible, do this step after step 3.
3. On the surfacer, cut the board to its finish thickness. Surface the board with the planed face down. This will make the second face flat and parallel to the first.
4. Rip the board to the desired width on the table saw. Make sure the jointed edge is against the fence.
5. On the table saw, square one end of the board. Then cut the board to length.

You can also use the surfacer to size square parts such as furniture legs. Simply joint one face and edge. Set the surfacer for the desired cutting depth. Then surface the two opposite sides with the same setting.

New Terms

- | | |
|------------------|-----------------|
| 1. backing board | 4. self-feeding |
| 2. infeed roll | 5. surfacer |
| 3. outfeed roll | |

Study Questions

1. For what one purpose are surfacers used?
2. What is the length of the shortest board that should be surfaced on most surfacers?
3. What is the maximum cutting depth for most cuts made on a surfacer?
4. On surfacers with variable-speed feed controls, would you use the fastest rate for rough, or for finish cuts?
5. List the basic steps in squaring stock with power tools.
6. What are three necessary features of a backing board?